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have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying unit.

32. (NEW) An optical amplifier for amplifying wavelength division multiplexed signal light which contains respective optical signals of a first wavelength band and a second wavelength band, comprising:

optical amplifying means amplifying said wavelength division multiplexed signal light, and supplying an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying means.

REMARKS

I. STATUS OF THE CLAIMS

Claims 13 and 15-17 are canceled herein.

Various of the claims are amended herein.

New claims 18-31 are added.

In view of the above, it is respectfully submitted that claims 1-12, 14, and 18-32 are currently pending and under consideration.

II. REJECTION OF CLAIMS 1, 2 AND 5 UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

Claims 1, 2, and 5 are amended herein to overcome the rejection.

In view of the above, it is respectfully submitted that the rejection is overcome.

III. REJECTIONS OF CLAIMS 1-4 AND 8 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER MA ET AL. (USP# 6,151,160) IN VIEW OF GRUBB (USP# 5,323,404)

The present invention as recited, for example, in claim 1 as amended herein, relates to an optical amplifier wherein "said optical amplifying means supplying said excitation light which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying means."

Ma discloses an optical amplifier used for an optical WDM transmission system. More specifically, as shown in Fig. 4 and column 3, line 66- column 4, line 36, in the optical amplifier of Ma, the WDM optical signal traversing the optical transmission path is split by the splitter 303 into a plurality of bands. The bands are respectively amplified by the corresponding EDFAs 308_1-308_N, and subsequently recombined by wavelength routing device 305. The losses generated in the splitter 303 are compensated by disposing a Raman amplifier as the preamplifier 302 to the prestage of the splitter 303 and amplifying all the bands collectively.

The Examiner asserts that Ma teaches an excitation light for the Raman amplifier 302 and EDFAs 304 but fails to teach the same pump wavelength for both the Raman amplifier and EDFA.

Therefore, Ma does not disclose the features as recited, for example, in claim 1 of the present application.

Grubb discloses, in Fig. 1, for example, a Raman laser 10 provided with a plurality of cavities comprising the refractive index gratings 151, 152, 161, 162, 171 and 172. In Fig. 5, Grubb discloses the optical fiber communication system 50 using the light emitted by the Raman laser 10, as a pump source of an EDFA. As described in column 7, lines 1-18, in the system 50, light of 1.48 μm emitted by the Raman pump laser 56 arranged on the receiver end is propagated toward the EDFA 54 on the transmission fiber 53 so that the signal radiation 52 is amplified. Additionally, the signal radiation 52 is amplified by SRS (stimulated Raman scattering) in the transmission fiber in the presence of the pump radiation 58.

The Examiner asserts that Grubb teaches in Fig. 5, a laser 56 which excites both a rare earth element (erbium) doped fiber and a Raman amplification producing medium. Thus, the Examiner believes that claims 1-4 and 8 are unpatentable, because it would have been obvious to modify Ma to include an excitation laser downstream of the EDFA for generating the excitation light having a wavelength capable of both producing the Raman amplification and exciting the rare earth doped fiber as taught by Grubb, in order to make the device of Ma, et al. more useful for long distance communications.

It is respectfully submitted to the Examiner that neither Ma nor Grubb, alone or in combination, disclose the features as recited, for example, in claim 1 of the present application.

For example, Grubb discloses that the signal radiation 52 amplified in the EDFA 54 by the pump radiation 58 of 1.48 μm and output from the pump laser 56 has a light signal of the same wavelength band as the signal radiation 52 amplified by the SRS in the transmission fiber, which is a wavelength of 1.55 μm (see column 6, lines 60-64).

In contrast, the claimed optical amplifier for amplifying wavelength division multiplexed signal light contains respective optical signals of a first wavelength band and a second wavelength band as recited in claim 1. Further, the optical signal of the first wavelength band is not Raman amplified, and only the optical signal of the second wavelength band is Raman amplified. Thus, for example, the claimed optical amplifier having optical amplifying means supplies excitation light which has a wavelength capable of producing Raman amplification with respect to optical signals of the second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of the optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by the Raman amplification producing medium are input to the optical amplifying means, as recited in claim 1 of the present application.

Therefore, neither Ma nor Grubb, alone or in combination, suggest or disclose the features as recited in claim 1 of the present application.

It is respectfully submitted that claims 2-4 and 8, which depend from and include all of the features set forth in claim 1, also patentably distinguish over the teachings of Ma and Grubb.

In view of the above, it is respectfully submitted that the rejection is overcome.

IV. REJECTION OF CLAIMS 5, 6, AND 7 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER MA ET AL. IN VIEW OF GRUBB AS APPLIED TO CLAIM 2 ABOVE, AND FURTHER IN VIEW OF MITSUDA (USP# 5,563,733)

The present invention as recited, for example, in claim 5 relates to an optical amplifier in which "said optical amplifying means supplying a part of said excitation light used in a part of said pre-stage optical amplifying section to said Raman amplification producing medium, wavelength division multiplexed signal light which contains optical signals of said second wavelength band which have been Raman amplified by said Raman amplification producing medium are input to said pre-stage optical amplifying section."

Mitsuda discloses an optical fiber amplifier capable of amplifying a plurality of signals having different wavelengths so that the gains of the signals are made equal to each other. More specifically, for example, as shown in Fig. 1, pump light emitted from the pump laser diode 12 is supplied to the EDFs 32 and 33 connected in cascade with each other. The first signal 51 and the second signal 53 are amplified by the EDF 32, then separated from each other by the WDM coupler 24. Thereby, only the second signal 53 is amplified by the EDF 33.

However, Mitsuda does not disclose or suggest the features as recited in claim 5 of the present application.

The present invention as recited, for example, in claim 6 relates to an optical amplifier "wherein when said first wavelength band is a 1550 nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said pre-stage optical amplifying section contains a 1480nm band."

Neither Ma, Grubb, nor Mitsuda, alone or in combination, suggest or disclose the features as recited in claim 6 of the present application.

The present invention as recited, for example, in claim 7 relates to an optical amplifier "wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium."

As shown in Figs. 1-9 of Mitsuda, for example, since there exits an optical isolator on the pre-stage of the optical amplifying section, the excitation light does not appear to be supplied forwardly. Additionally, both of the first signal 51 and the second signal 53 are one-wave signals rather than bands and thus, are amplified by the EDFA 32. Thus, Mitsuda does not disclose the features as recited in claim 7 of the present application.

Therefore, neither Ma, Grubb, nor Mitsuda, alone or in combination, suggest or disclose the features as recited, for example, in claims 5, 6, and 7 of the present application.

In view of the above, it is respectfully submitted that the rejection is overcome.

V. REJECTION OF CLAIM 9 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER MA ET AL. IN VIEW OF GRUBB AS APPLIED TO CLAIM 1 ABOVE, AND FURTHER IN VIEW OF WATANABE ET AL.

The present invention as recited, for example, in claim 9 relates to an optical amplifier "wherein said external transmission path is of a hybrid transmission path formed by connecting a positive dispersion fiber having a positive wavelength dispersion value and a positive dispersion slope with respect to a signal light wavelength band, and a negative dispersion fiber having a negative wavelength dispersion value and a negative dispersion slope with respect to the signal light wavelength band, wherein one end on the side of said negative dispersion fiber is arranged at an input side of said optical amplifying means and functions as said Raman amplification producing medium."

Watanabe discloses the compensation of wavelength dispersion in a SMF by utilizing optical phase conjugation. More specifically, as shown in Fig. 1, Watanabe describes the optical transmission path wherein two SMFs are connected with each other through a phase conjugator.

However, the technique for compensating wavelength dispersion as described by Watanabe is to arrange the phase conjugator in the midway of the transmission path so as to compensate for the wavelength dispersion generated in the SMF (positive dispersion fiber) utilizing the optical phase conjugation. In contrast, the hybrid transmission path connects the positive and negative dispersion fibers as recited, for example, in claim 9 of the present application. Thus, for example, positive and negative dispersion fibers are used in connection with each other rather than the optical phase conjugation for compensating wavelength dispersion.

Therefore, Watanabe does not disclose the features as recited in claim 9 of the present application.

In view of the above, it is respectfully submitted that the rejection is overcome.

VI. REJECTION OF CLAIMS 10, 11, AND 12 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER MA ET AL. IN VIEW OF GRUBB AS APPLIED TO CLAIM 1 ABOVE, AND FURTHER IN VIEW OF KOSAKA (USP# 6,229,641)

The comments in section III, above, also apply here.

Moreover, for example, since claims 10, 11, and 12 depend from and include all of the features set forth in claim 1, claims 10, 11, and 12 also patentably distinguish over the teachings of Ma, Grubb, and Kosaka.

In view of the above, it is respectfully submitted that the rejection is overcome.

VII. REJECTION OF CLAIM 13 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER MITSUDA IN VIEW OF MA ET AL.

Claim 13 is canceled herein.

VIII. REJECTION OF CLAIMS 14-17 UNDER 35 U.S.C. § 103(A) AS BEING UNPATENTABLE OVER MITSUDA IN VIEW OF MA ET AL. AS APPLIED TO CLAIM 13 ABOVE, AND FURTHER IN VIEW OF KOSAKA

Claim 14 is amended herein, and depends from claim 5. Claims 15-17 are canceled herein.

In view of the above, it is respectfully submitted that the rejection is overcome.

IX. NEW CLAIMS

New claims 18 recites an optical amplifier wherein "said optical amplifying unit supplying said excitation light which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying unit, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying unit" which is patentably distinguishing over the cited prior art.

New independent claims 31 and 32 set forth similar features as recited, for example, in claim 18, and also patentably distinguish over the cited prior art.

X. CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that each of the claims patentably distinguishes over the prior art, and therefore defines allowable subject matter. A prompt and favorable reconsideration of the rejection along with an indication of allowability of all pending claims are therefore respectfully requested.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: 12-20-01

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Naomi Anderson
Date December 20, 2001

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please CANCEL claims 13 and 15-17 without prejudice or disclaimer.

Please AMEND the following claims:

1. (ONCE AMENDED) An optical amplifier for amplifying wavelength division multiplexed signal light which contains respective optical signals of a first wavelength band and a second wavelength band, comprising:

optical amplifying means [for] amplifying said wavelength division multiplexed signal light using a rare earth element doped fiber to which excitation light is supplied,

wherein the excitation light used by said optical amplifying means has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band, and

[by] said optical amplifying means supplying [a part of] said excitation light [used in said optical amplifying means] which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying means.

2. (ONCE AMENDED) An optical amplifier according to claim 1,

wherein there is provided demultiplexing means [for] demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and multiplexing means [for] multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing means,

said optical amplifying means has a first amplifying section [for] amplifying optical signals of the first wavelength band which have been demultiplexed by said demultiplexing means, and a second amplifying section [for] amplifying optical signals of the second wavelength band which have been demultiplexed by said demultiplexing means, and

[by] said optical amplifying means supplying via said demultiplexing means a part of said

excitation light used in said first amplifying section to said Raman amplification producing medium, so that optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input via said demultiplexing means to said second optical amplifying section.

3. (AS UNAMENDED) An optical amplifier according to claim 2, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said first optical amplifying section contains a 1480nm band.

4. (ONCE AMENDED) An optical amplifier according to claim 3, wherein said first optical amplifying section comprises an erbium doped fiber, at least one excitation light source [for] generating excitation light of a 1480nm band, and an optical coupler [for] supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, [and] wherein a part of said excitation light is passed through said erbium doped fiber and said demultiplexing means and supplied to said Raman amplification producing medium.

5. (ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided demultiplexing means [for] demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and multiplexing means [for] multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing means,

said optical amplifying means has a pre-stage amplifying section [for] collectively amplifying said wavelength division multiplexed signal light input to said demultiplexing means, and a second optical amplifying section [for] amplifying only optical signals of the second wavelength band which have been demultiplexed by said demultiplexing means, and

[by] said optical amplifying means supplying a part of said excitation light used in a part of said pre-stage optical amplifying section to said Raman amplification producing medium, wavelength division multiplexed signal light which contains optical signals of said second wavelength band which have been Raman amplified by said Raman amplification producing medium are input to said pre-stage optical amplifying section.

6. (AS UNAMENDED) An optical amplifier according to claim 5, wherein when said

first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said pre-stage optical amplifying section contains a 1480nm band.

7. (ONCE AMENDED) An optical amplifier according to claim 6, wherein said pre-stage optical amplifying section comprises[;] an erbium doped fiber, at least one excitation light source [for] generating excitation light of a 1480nm band, and an optical coupler [for] supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, [and] wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium.

8. (AS UNAMENDED) An optical amplifier according to claim 1, wherein said Raman amplification producing medium is an optical fiber which is designed so that a non-linear effective cross section is small compared to a 1.3μm zero dispersion single mode fiber.

9. (ONCE AMENDED) An optical amplifier according to claim 1, wherein said external transmission path is of a hybrid transmission path formed by connecting a positive dispersion fiber having a positive wavelength dispersion value and a positive dispersion slope with respect to a signal light wavelength band, and a negative dispersion fiber having a negative wavelength dispersion value and a negative dispersion slope with respect to the signal light wavelength band, [and] wherein one end on the side of said negative dispersion fiber is arranged at an input side of said optical amplifying means and functions as said Raman amplification producing medium.

10. (ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided optical power constant control means [for] monitoring an output power of said wavelength division multiplexed signal light, and controlling an excitation light driving condition of said optical amplifying means so that said output power becomes constant.

11. (ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided gain constant control means [for] monitoring a gain in said optical amplifying means, and controlling an excitation light driving condition of said optical amplifying means so that said gain becomes constant.

12. (ONCE AMENDED) An optical amplifier according to claim 1, wherein there is provided supervisory control means [for] processing a supervisory control signal transmitted together with said wavelength division multiplexed signal light.

13. (CANCELED)

14. (ONCE AMENDED) An optical amplifier according to claim [13] <u>5</u> comprising:

first power monitor means [for] monitoring the optical signal power of the first wavelength band which has been demultiplexed by said demultiplexing means;

second power monitor means [for] monitoring the optical signal power of the second wavelength band which has been amplified by said [post-stage] <u>second</u> optical amplifying [means] <u>section</u>; and

optical power deviation control means [for] controlling the operation of at least one of said pre-stage optical amplifying [means] <u>section</u> and said [post-stage] <u>second</u> optical amplifying [means] <u>section</u> in response to the respective monitor results of the first and second power monitor means, so that the optical power deviation for the first and the second wavelength bands becomes constant.

15. (CANCELED)

16. (CANCELED)

17. (CANCELED)

Please ADD the following NEW claims:

18. (NEW) An optical amplifier for amplifying wavelength division multiplexed signal light which contains respective optical signals of a first wavelength band and a second wavelength band, comprising:

an optical amplifying unit amplifying said wavelength division multiplexed signal light using a rare earth element doped fiber to which excitation light is supplied,

wherein the excitation light used by said optical amplifying unit has a wavelength capable of producing Raman amplification with respect to optical signals of said second wavelength band, and

said optical amplifying unit supplying said excitation light which has the wavelength capable of producing the Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying unit, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying unit.

19. (NEW) An optical amplifier according to claim 18,

wherein there is provided a demultiplexing unit demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and a multiplexing unit multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing unit,

said optical amplifying unit has a first amplifying section amplifying optical signals of the first wavelength band which have been demultiplexed by said demultiplexing unit, and a second amplifying section amplifying optical signals of the second wavelength band which have been demultiplexed by said demultiplexing unit, and

said optical amplifying unit supplying via said demultiplexing unit a part of said excitation light used in said first amplifying section to said Raman amplification producing medium, so that optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input via said demultiplexing unit to said second optical amplifying section.

20. (NEW) An optical amplifier according to claim 19, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said first optical amplifying section contains a 1480nm band.

21. (NEW) An optical amplifier according to claim 20, wherein said first optical amplifying section comprises an erbium doped fiber, at least one excitation light source generating excitation light of a 1480nm band, and an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and said demultiplexing

unit and supplied to said Raman amplification producing medium.

22. (NEW) An optical amplifier according to claim 18, wherein there is provided a demultiplexing unit demultiplexing said wavelength division multiplexed signal light into respective optical signals of a first wavelength band and a second wavelength band, and a multiplexing unit multiplexing respective optical signals of the first wavelength band and the second wavelength band which have been demultiplexed by said demultiplexing unit,

said optical amplifying unit has a pre-stage amplifying section collectively amplifying said wavelength division multiplexed signal light input to said demultiplexing unit, and a second optical amplifying section amplifying only optical signals of the second wavelength band which have been demultiplexed by said demultiplexing unit, and

said optical amplifying unit supplying a part of said excitation light used in a part of said pre-stage optical amplifying section to said Raman amplification producing medium, wavelength division multiplexed signal light which contains optical signals of said second wavelength band which have been Raman amplified by said Raman amplification producing medium are input to said pre-stage optical amplifying section.

23. (NEW) An optical amplifier according to claim 22, wherein when said first wavelength band is a 1550nm band and said second wavelength band is a 1580nm band, a wavelength of the excitation light used in said pre-stage optical amplifying section contains a 1480nm band.

24. (NEW) An optical amplifier according to claim 23, wherein said pre-stage optical amplifying section comprises:

an erbium doped fiber;

at least one excitation light source generating excitation light of a 1480nm band; and

an optical coupler supplying excitation light generated by said excitation light source to said erbium doped fiber from a rear side, wherein a part of said excitation light is passed through said erbium doped fiber and supplied to said Raman amplification producing medium.

25. (NEW) An optical amplifier according to claim 18, wherein said Raman amplification producing medium is an optical fiber which is designed so that a non-linear effective cross section is small compared to a 1.3μm zero dispersion single mode fiber.

26. (NEW) An optical amplifier according to claim 18, wherein said external transmission path is of a hybrid transmission path formed by connecting a positive dispersion fiber having a positive wavelength dispersion value and a positive dispersion slope with respect to a signal light wavelength band, and a negative dispersion fiber having a negative wavelength dispersion value and a negative dispersion slope with respect to the signal light wavelength band, wherein one end on the side of said negative dispersion fiber is arranged at an input side of said optical amplifying unit and functions as said Raman amplification producing medium.

27. (NEW) An optical amplifier according to claim 18, wherein there is provided an optical power constant control unit monitoring an output power of said wavelength division multiplexed signal light, and controlling an excitation light driving condition of said optical amplifying unit so that said output power becomes constant.

28. (NEW) An optical amplifier according to claim 18, wherein there is provided a gain constant control unit monitoring a gain in said optical amplifying unit, and controlling an excitation light driving condition of said optical amplifying unit so that said gain becomes constant.

29. (NEW) An optical amplifier according to claim 18, wherein there is provided a supervisory control unit processing a supervisory control signal transmitted together with said wavelength division multiplexed signal light.

30. (NEW) An optical amplifier according to claim 22, further comprising:

a first power monitor unit monitoring the optical signal power of the first wavelength band which has been demultiplexed by said demultiplexing unit;

a second power monitor unit monitoring the optical signal power of the second wavelength band which has been amplified by said second optical amplifying section; and

an optical power deviation control unit controlling the operation of at least one of said pre-stage optical amplifying section and said second optical amplifying section in response to the respective monitor results of the first and second power monitor unit, so that the optical power deviation for the first and the second wavelength bands becomes constant.

31. (NEW) An optical amplifier for amplifying wavelength division multiplexed signal light which contains respective optical signals of a first wavelength band and a second

wavelength band, comprising:

an optical amplifying unit amplifying said wavelength division multiplexed signal light, and supplying an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying unit, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying unit.

32. (NEW) An optical amplifier for amplifying wavelength division multiplexed signal light which contains respective optical signals of a first wavelength band and a second wavelength band, comprising:

optical amplifying means amplifying said wavelength division multiplexed signal light, and supplying an excitation light having a wavelength capable of producing a Raman amplification with respect to the optical signals of said second wavelength band to a Raman amplification producing medium which forms at least a part of an external transmission path arranged on a pre-stage side of said optical amplifying means, so that wavelength division multiplexed signal light which contains optical signals of the second wavelength band which have been Raman amplified by said Raman amplification producing medium, are input to said optical amplifying means.